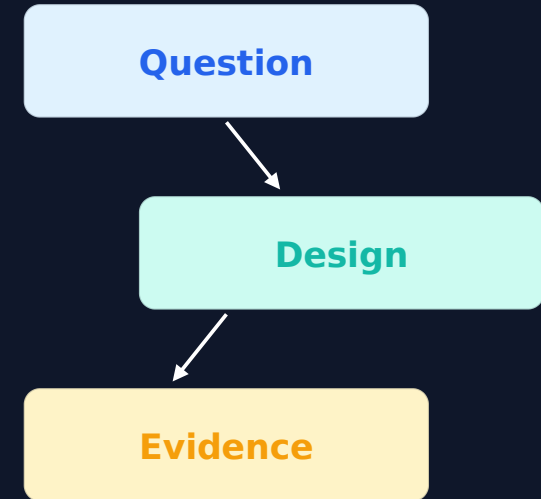


Research Design: Types and Applications

A student-friendly lecture on how to plan, structure, and justify research studies

Research Methodology Lecture

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Lecture Overview

Overview

What this lecture covers and how the ideas connect

1 Meaning

What research design means and why it matters.

2 Types

Exploratory, descriptive, causal, qualitative, quantitative, and mixed methods designs.

3 Process

How to select, plan, and justify a suitable design.

4 Applications

Examples from social sciences, business, education, health, psychology, and IT.

5 Evaluation

Advantages, limitations, ethics, common mistakes, and best practices.

Research design turns an idea into a disciplined plan for collecting and interpreting evidence.

Learning Objectives

Objectives

After this lecture, students should be able to...

1 Objective 1

Define research design and explain its role in academic research.

2 Objective 2

Distinguish major types of research designs and their applications.

3 Objective 3

Match research questions with appropriate qualitative, quantitative, or mixed methods designs.

4 Objective 4

Describe the step-by-step process of creating a research design.

5 Objective 5

Identify strengths, limitations, ethical issues, and common design mistakes.

6 Objective 6

Justify design choices in a proposal, thesis, dissertation, or research article.

Introduction

Why research design is essential in academic inquiry

Research design is the overall plan for answering a research question. It guides how the researcher will select participants, collect data, control bias, analyze evidence, and interpret findings.

- It connects the research problem to practical evidence.
- It helps researchers avoid vague, biased, or inconsistent methods.
- It makes a study easier to evaluate, replicate, and defend.
- It supports credible conclusions and transparent reporting.



Decisions include:

- participants
 - timing
- data sources
 - measures
 - analysis
 - ethics

Key Definitions

Important terms students should know

Research Design

The structured plan that explains how a study will answer its research question.

Methodology

The broader logic and principles behind the research approach.

Method

A specific procedure such as a survey, interview, observation, or experiment.

Population / Sample

The larger group of interest and the smaller group studied directly.

Variables

Characteristics or conditions that can vary, such as age, motivation, income, or test score.

Validity / Reliability

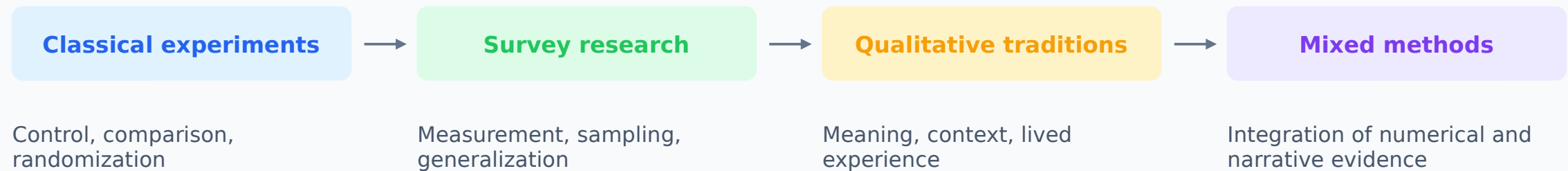
Validity concerns accuracy of conclusions; reliability concerns consistency of measurement.

Background and Context

Context

How research design developed as a core part of research methodology

Modern research design draws from scientific reasoning, social inquiry, experimental logic, qualitative traditions, and applied evaluation. Across disciplines, the goal is to create a clear link between questions, evidence, analysis, and conclusions.



Research design is now expected in proposals, theses, dissertations, grants, and peer-reviewed articles.

Research Design in the Research Process

Design decisions connect the beginning and end of a study



- A weak design produces weak evidence even when the topic is important.
- A strong design makes the study feasible, ethical, coherent, and defensible.
- Every design decision should be justified by the research question.

Main Concepts in Research Design

The building blocks of a strong study plan

Core Design Choices

- Purpose: exploration, description, explanation, evaluation, or prediction.
- Approach: qualitative, quantitative, or mixed methods.
- Time horizon: cross-sectional, longitudinal, retrospective, or prospective.
- Control: experimental, quasi-experimental, or non-experimental.

Quality Criteria

- Coherence between problem, question, data, and analysis.
- Validity, reliability, credibility, transferability, or trustworthiness.
- Feasibility in terms of time, access, budget, and skills.
- Ethical protection of participants and transparent reporting.

Types of Research Design at a Glance

Types

Major classifications used in academic research

Classification	Common Design Options
By purpose	Exploratory, descriptive, explanatory/causal, evaluative
By approach	Qualitative, quantitative, mixed methods
By control	Experimental, quasi-experimental, non-experimental
By time	Cross-sectional, longitudinal, retrospective, prospective
By setting	Laboratory, field, naturalistic, online, institutional

Important: a single study can combine several classifications, such as a cross-sectional descriptive survey or a longitudinal mixed methods evaluation.

Exploratory Research Design

Design Type

Used when the problem is new, unclear, or under-researched

- Purpose: generate ideas, clarify concepts, identify themes, and develop preliminary questions.
- Common methods: literature scanning, interviews, focus groups, observations, pilot studies, and expert consultation.
- Useful when little is known about a topic or when researchers need to define variables more clearly.
- Usually flexible and open-ended; findings often guide later descriptive or causal studies.

Example

A researcher explores why first-year university students hesitate to use academic writing centers. Interviews reveal barriers such as fear of judgment, lack of awareness, and schedule conflicts.

Output: concepts, themes, hypotheses, and a clearer problem statement

Descriptive Research Design

Design Type

Used to describe characteristics, patterns, or conditions

- Purpose: answer “what,” “where,” “when,” and “how many” questions.
- Common methods: surveys, structured observation, document analysis, and secondary data analysis.
- Often used to estimate prevalence, identify trends, profile groups, or summarize behaviors.
- Does not prove causation by itself, even when it shows strong patterns.

Awareness



Use



Satisfaction



Barriers



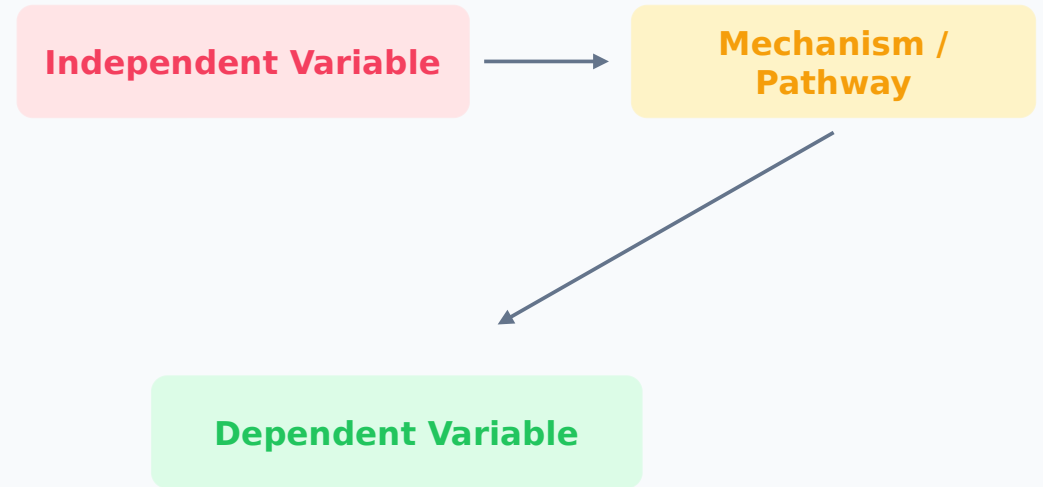
Example: A survey describes how often teachers use digital assessment tools and which tools they prefer.

Explanatory or Causal Research Design

Design Type

Used to examine why or how one factor affects another

- Purpose: test relationships, explanations, mechanisms, or cause-and-effect claims.
- Common methods: experiments, quasi-experiments, longitudinal analysis, regression, mediation, or comparison groups.
- Requires careful attention to alternative explanations, confounding variables, and temporal order.
- Causal claims are strongest when the design includes control, comparison, and clear timing.



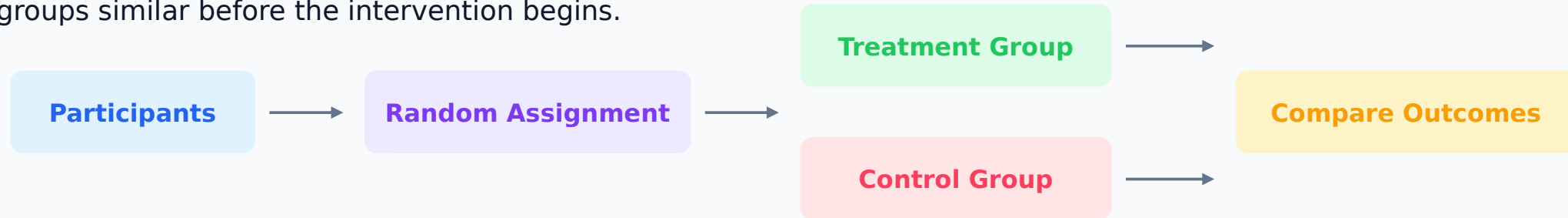
Example: Does a structured reading intervention improve Grade 5 reading comprehension scores?

Experimental Research Design

Design Type

Uses manipulation, comparison, and random assignment

In an experiment, the researcher actively manipulates an intervention or condition and compares outcomes between groups. Random assignment helps make groups similar before the intervention begins.

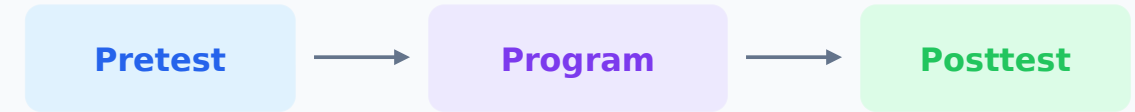


- Strong for testing cause-and-effect when implemented well.
- May be difficult in field settings because of cost, ethics, or access.
- Requires clear outcome measures and consistent treatment delivery.

Quasi-Experimental Research Design

Design Type

Tests interventions when random assignment is not possible



- Uses comparison groups, pretests, natural experiments, interrupted time series, or matched groups.
- Common in education, health, public policy, and organizational settings where randomization is impractical.
- Can support causal arguments, but alternative explanations must be examined carefully.
- Often stronger than simple one-group before-and-after studies.

Comparison group follows the same schedule without receiving the intervention.

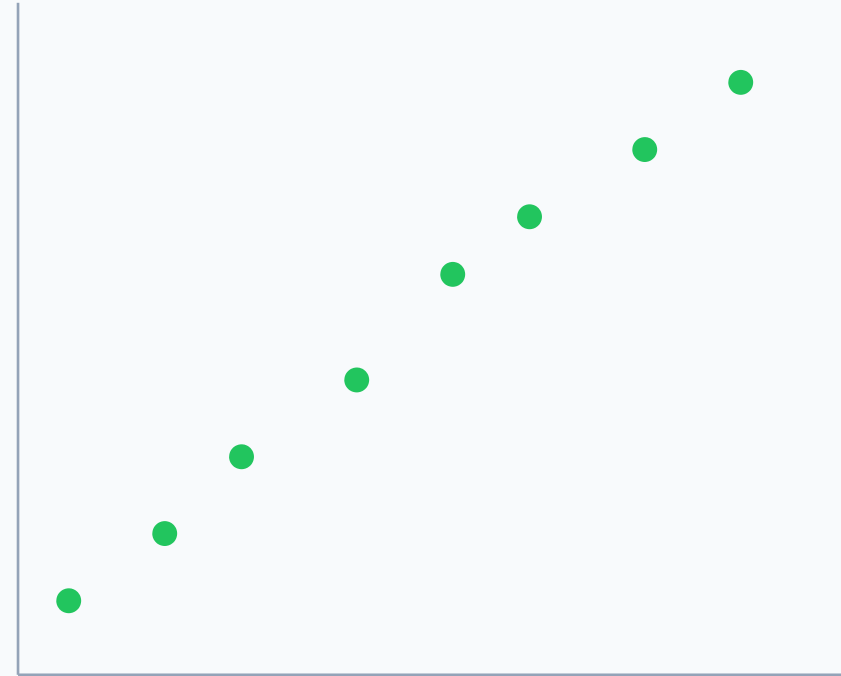
Example: Compare exam results in two similar schools where only one school adopts a new tutoring program.

Correlational Research Design

Design Type

Examines relationships without manipulating variables

- Purpose: measure whether variables are related and how strongly they move together.
- Common analyses: correlation coefficients, regression, prediction models, and association tests.
- Useful when manipulation is impossible, unethical, or unnecessary.
- Important caution: correlation does not automatically prove causation.



Example: Relationship between study time and exam score.

Cross-Sectional Research Design

Design Type

Collects data from participants at one point in time



- Useful for describing current conditions, opinions, behaviors, or group differences.
- Often faster and less costly than longitudinal research.
- Can compare groups, such as first-year vs. final-year students, at the same time.
- Limited for studying change because data are captured at a single time point.

Snapshot of a phenomenon

Example: A survey of employees' current job satisfaction in one month.

Longitudinal Research Design

Design Type

Collects data from the same or comparable units over time

- Useful for studying growth, change, development, trends, or long-term effects.
- Common forms include panel studies, cohort studies, and repeated measures designs.
- Stronger than cross-sectional designs for examining temporal order.
- Challenges include cost, attrition, missing data, and longer timelines.



Repeated observations reveal patterns of change.

Example: Track students' academic motivation across four semesters.

Qualitative Research Designs

Qualitative

Used to understand meaning, experience, context, and process

Case Study

In-depth study of a bounded case such as an organization, program, event, or community.

Phenomenology

Explores the lived experience and meaning of a phenomenon.

Ethnography

Studies culture, practices, and social life within a group or setting.

Grounded Theory

Develops a theory from systematically collected and analyzed qualitative data.

Narrative Inquiry

Examines stories, life histories, and personal accounts.

Action Research

Solves practical problems while involving participants in cycles of improvement.

Quantitative Research Designs

Quantitative

Used to measure variables, test hypotheses, and estimate patterns

- Survey design: collects structured data from a sample to describe or compare groups.
- Experimental design: manipulates an intervention to test causal effects.
- Quasi-experimental design: estimates effects without full random assignment.
- Correlational design: examines relationships among variables.
- Secondary data design: analyzes existing datasets, records, or databases.

Hypothesis

Measures

Variables

Sample

Statistics

Mixed Methods Research Design

Combines quantitative and qualitative approaches in one study

Mixed methods designs integrate numerical and narrative evidence to provide a more complete understanding of a research problem.

1 Convergent

Collect qualitative and quantitative data in parallel; compare and integrate results.

2 Explanatory Sequential

Start with quantitative data; use qualitative data to explain results.

3 Exploratory Sequential

Start with qualitative data; use findings to build or test quantitative measures.

4 Embedded

Add one type of data inside a larger qualitative or quantitative design.

Integration is the defining feature: the two forms of data must inform one another.

Step-by-Step Process for Creating a Research Design

Process

A practical sequence for proposals, theses, and dissertations

1 Clarify the problem

Define the gap, issue, or practical need.

2 Write the research question

Make it specific, answerable, and aligned with the purpose.

3 Select design type

Choose based on purpose, approach, control, and time.

4 Plan data collection

Decide participants, sampling, instruments, and procedures.

5 Plan analysis

Match analysis to data type and question.

6 Address quality and ethics

Plan validity, reliability, trustworthiness, consent, and privacy.

Choosing the Right Research Design

Decision Guide

Start with the question, not with the method you prefer



Practical Examples Across Disciplines

Applications

How research design choices vary by field and purpose

Discipline	Possible Research Question	Suitable Design
Social sciences	How do migrants experience access to public services?	Qualitative case study
Business	What factors predict customer loyalty in online retail?	Correlational survey
Education	Does peer tutoring improve mathematics scores?	Quasi-experimental
Health sciences	What is the prevalence of burnout among nurses?	Cross-sectional descriptive
Psychology	How does mindfulness training affect stress?	Experimental or quasi-experimental
Information technology	Why do users abandon a mobile app after onboarding?	Mixed methods usability study

Detailed Research Scenario

Research Example

Applying research design in an actual study

Study Elements

- Research topic: Online learning engagement among undergraduate students.
- Research problem: Many students attend online classes but show low participation and completion.
- Research question: What factors influence engagement in online learning, and how do students describe these factors?
- Population: Undergraduate students enrolled in online courses at a university.

Design Application

- Design: Explanatory sequential mixed methods design.
- Data collection: Survey first, followed by interviews with selected students.
- Analysis: Descriptive statistics and regression; thematic analysis for interviews.
- Expected interpretation: Quantitative results identify key predictors; interviews explain why these factors matter.

Aligning Questions, Data, and Analysis

A good design makes every part of the study fit together

Question Type	Data Needed	Analysis Method	Likely Design
What is happening?	Survey, records, observation	Frequencies, percentages, descriptive statistics	Descriptive design
Why is it happening?	Survey + interviews, comparison groups	Regression, thematic analysis, causal modeling	Explanatory design
Does it work?	Pretest/posttest, control or comparison group	t-test, ANOVA, regression, effect size	Experimental/quasi-experimental
How is it experienced?	Interviews, diaries, field notes	Coding and thematic analysis	Qualitative design

Tip: If your analysis cannot answer your question, the design needs revision.

Comparison Table: Common Research Designs

Comparison

Strengths and suitable applications

Design	Main Purpose	Key Strength	Main Limitation
Exploratory	Clarify a new or unclear problem	Flexible; generates ideas	Limited generalizability
Descriptive	Describe population or phenomenon	Clear summary of patterns	Does not prove causation
Correlational	Examine relationships between variables	Useful for prediction	Cannot alone establish causality
Experimental	Test intervention effects	Strongest causal evidence	May be costly or artificial
Quasi-experimental	Evaluate interventions without randomization	Practical in real settings	More threats to validity
Mixed methods	Combine breadth and depth	Richer understanding	Requires more time and skill

Advantages and Applications of Strong Research Design

Advantages

Why careful planning improves the entire study

1 Clarity

Defines what evidence is needed and how it will be collected.

2 Credibility

Improves validity, reliability, trustworthiness, and transparency.

3 Efficiency

Reduces wasted time, unsuitable methods, and unclear analysis.

4 Ethics

Plans participant protection before data collection begins.

5 Communication

Helps reviewers, supervisors, and readers evaluate the study.

6 Application

Supports stronger conclusions, recommendations, and future research.

Limitations and Challenges

No research design is perfect in every situation

- Access limitations: some populations, records, or settings may be difficult to reach.
- Resource limitations: strong designs may require time, funding, trained researchers, or equipment.
- Validity concerns: confounding, selection bias, measurement error, and attrition can weaken conclusions.
- Ethical limits: some interventions cannot be assigned or withheld for ethical reasons.
- Context limits: findings may not transfer or generalize beyond the setting studied.

Design trade-off

Researchers often balance rigor, feasibility, ethics, and relevance. The best design is not always the most complex design; it is the most appropriate design for the question and context.

Rigor ↔ Feasibility ↔ Ethics ↔ Relevance

Common Mistakes in Research Design

Common Mistakes

Frequent errors made by beginning researchers

Mistake 1

Choosing a method before clarifying the research question.

Mistake 2

Using causal language for a descriptive or correlational design.

Mistake 3

Collecting data that cannot answer the research question.

Mistake 4

Ignoring sampling strategy, sample size, or participant access.

Mistake 5

Using instruments without explaining validity or reliability.

Mistake 6

Overloading one study with too many objectives and variables.

Mistake 7

Treating ethical approval as paperwork instead of participant protection.

Best Practices for Applying Research Design Correctly

Practical recommendations for students and researchers

Best Practices

- Write the research question first, then select the design that can answer it.
- Use an alignment table to connect questions, variables, data, analysis, and interpretation.
- Justify design choices with methodological literature, not personal preference alone.
- Plan sampling, instruments, procedures, and analysis before data collection.
- Pilot test tools and procedures when possible.
- Report limitations honestly and explain how they were managed.
- Keep ethical protection and transparency at the center of the design.

Design Quality Checklist

✓ **Question clarity**

✓ **Design fit**

✓ **Sampling logic**

✓ **Data quality**

✓ **Analysis match**

✓ **Ethics plan**

Ethical Considerations in Research Design

Ethics should be built into the design from the beginning

1 Informed consent

Participants should understand the study, risks, benefits, and their right to withdraw.

2 Privacy and confidentiality

Data should be collected, stored, and reported in ways that protect identities.

3 Risk minimization

Researchers should avoid unnecessary harm, pressure, or deception.

4 Bias and fairness

Sampling, instruments, and interpretation should avoid unfair exclusion or stereotyping.

5 Transparency

Design decisions, limitations, funding, and conflicts of interest should be reported honestly.

6 Academic integrity

Do not fabricate data, manipulate results, plagiarize, or hide unfavorable findings.

Activity and Discussion Questions

Classroom Exercise

A short classroom exercise for applying design selection

Activity Objective

Practice matching research questions with suitable research designs and justify the choice.

Instructions

- Work in pairs or small groups.
- Choose one research question from your discipline.
- Identify purpose, approach, time horizon, data source, and analysis.
- Present a one-minute justification.

Expected Outcome

Students produce a short design justification that can become part of a proposal.

Discussion Questions

1. Why should design follow the research question?
2. When is an exploratory design better than a descriptive design?
3. What makes experimental designs stronger for causal claims?
4. Why might a researcher choose a quasi-experiment?
5. How can mixed methods improve interpretation?
6. Which design limitations are most serious in your field?
7. How do ethics shape design choices?

Knowledge Check

Assessment

Multiple-choice and short-answer questions

1. What is the main purpose of a research design?
2. Which design is most appropriate when little is known about a topic?
3. Why does random assignment matter in experimental research?
4. A one-time survey of nurses' burnout levels is most likely what design?
5. Why can correlation alone be insufficient for causation?
6. Name one advantage of mixed methods research.
7. What is one ethical issue that should be planned before data collection?
8. Which design is useful for studying change over time?

Use as a quick quiz, group review, or exit ticket.

Suggested format:

- 5 minutes individual answers
- 5 minutes peer comparison
- 5 minutes instructor review

Answer key is provided on the next slide.

Answer Key, Key Takeaways, and Conclusion

[Review](#)

Review the answers and final message of the lecture

Answer Key

1. To plan how the study answers its research question.
2. Exploratory design.
3. It helps create comparable groups.
4. Cross-sectional descriptive design.
5. Other explanations or third variables may exist.
6. It combines breadth with depth.
7. Consent, privacy, risk, confidentiality, or fairness.
8. Longitudinal design.

Key Takeaways

- Research design is the blueprint of a study.
- Different designs answer different kinds of questions.
- Alignment among question, data, and analysis is essential.
- Design choices affect credibility, ethics, and interpretation.
- Good researchers justify both strengths and limitations.

Conclusion

A well-planned research design makes a study coherent, ethical, feasible, and credible. It helps researchers move from a research problem to trustworthy evidence and meaningful conclusions.

References and Final Slide

Selected sources in APA 7th edition format

References

Babbie, E. R. (2020). The practice of social research (15th ed.). Cengage Learning.

Creswell, J. W., & Creswell, J. D. (2023). Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.). SAGE Publications.

Flick, U. (2023). An introduction to qualitative research (7th ed.). SAGE Publications.

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). Research methods for business students (8th ed.). Pearson.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). Experimental and quasi-experimental designs for generalized causal inference. Houghton Mifflin.

Yin, R. K. (2018). Case study research and applications: Design and methods (6th ed.). SAGE Publications.

Thank You

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